**8) INTERSECTION OF A STRAIGHT LINE AND A CONIC SECTION**

When given the equation of a straight line and a conic section, solve simultaneously to get a resulting ***quadratic equation***.

* To find the points of intersection: solve the quadratic equation for .
* To determine if a line *does* intersect a conic section, do the discriminant test.

**The discriminant test:**

Your resulting quadratic equation should be in the form .

Find the value of the discriminant .

* If > 0, (the quadratic has 2 real solns) i.e the line and the conic section intersect at 2 points
* If = 0, (the quadratic has one real soln) i.e. the line is a tangent to the conic.
* If < 0, (the quadratic has no real soln) i.e. the line does not intersect the conic.

Examples:

1) Find the points of intersection of the line and the hyperbola .

(note that the hyperbola could be written as )

Substitute into the equation and solve for :

solve on Graphics Calculator or use Quadratic Formula

Therefore the points of intersections are and .

2) Determine if the line intersects the ellipse at 2 points, is a

tangent, or does not intersect. Give the coordinate(s) of the point of intersection if

applicable.

Substitute into .

multiplying both sides by 225

dividing by 9

Now do the discriminant test: work out what the value of is for this resulting quadratic:

The value of is positive, so the quadratic has 2 real solutions. Therefore the line intersects the ellipse in 2 places.

Solve the quadratic for to find the coordinates of the points of intersection:

Using Graphics Calculator or Quadratic Formula:

The coordinates of the points of intersection are: and .

Worksheet

Delta Ex 38.1 pg 377, Q2, 3

Extension Q4